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Douglas-Fir Beetle

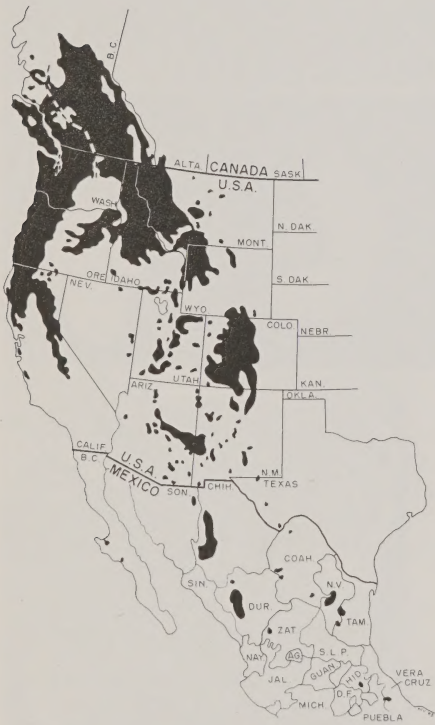
M. M. Furniss¹ and P. W. Orr²

The Douglas-fir beetle (*Dendroctonus pseudotsugae* Hopk.) is a destructive insect enemy of Douglas-fir, the most important lumber tree of western North America. The beetle is found throughout most of the range of its host tree (fig. 1)—in the

Rocky Mountain region from northern Mexico into Canada and in the Pacific Coast region from central California northward through Oregon and Washington to Vancouver Island.

Though the beetle normally kills small groups or individual trees, the loss on a regional basis is of considerable economic value. At times, the Douglas-fir beetle is relieved of the controlling effects of its natural enemies, and the ensuing infestation can be devastating. During four catastrophic outbreaks in western Oregon and Washington, from 1950–1969, some 7.4 billion board feet of prime timber was killed. Between these outbreaks, annual losses averaged 10 million board feet. Other Douglas-fir forests in the West have suffered similarly severe killing by the beetle. For example, an outbreak in northern California killed 800 million board feet of timber in 1966.

Epidemics of the Douglas-fir beetle usually develop in trees damaged by some evident disturbance in the forest such as wind-falls, fire-scorched trees, logging slash, and trees weakened by defoliation. Where such preferred breeding places are abundant, the beetle population often builds up

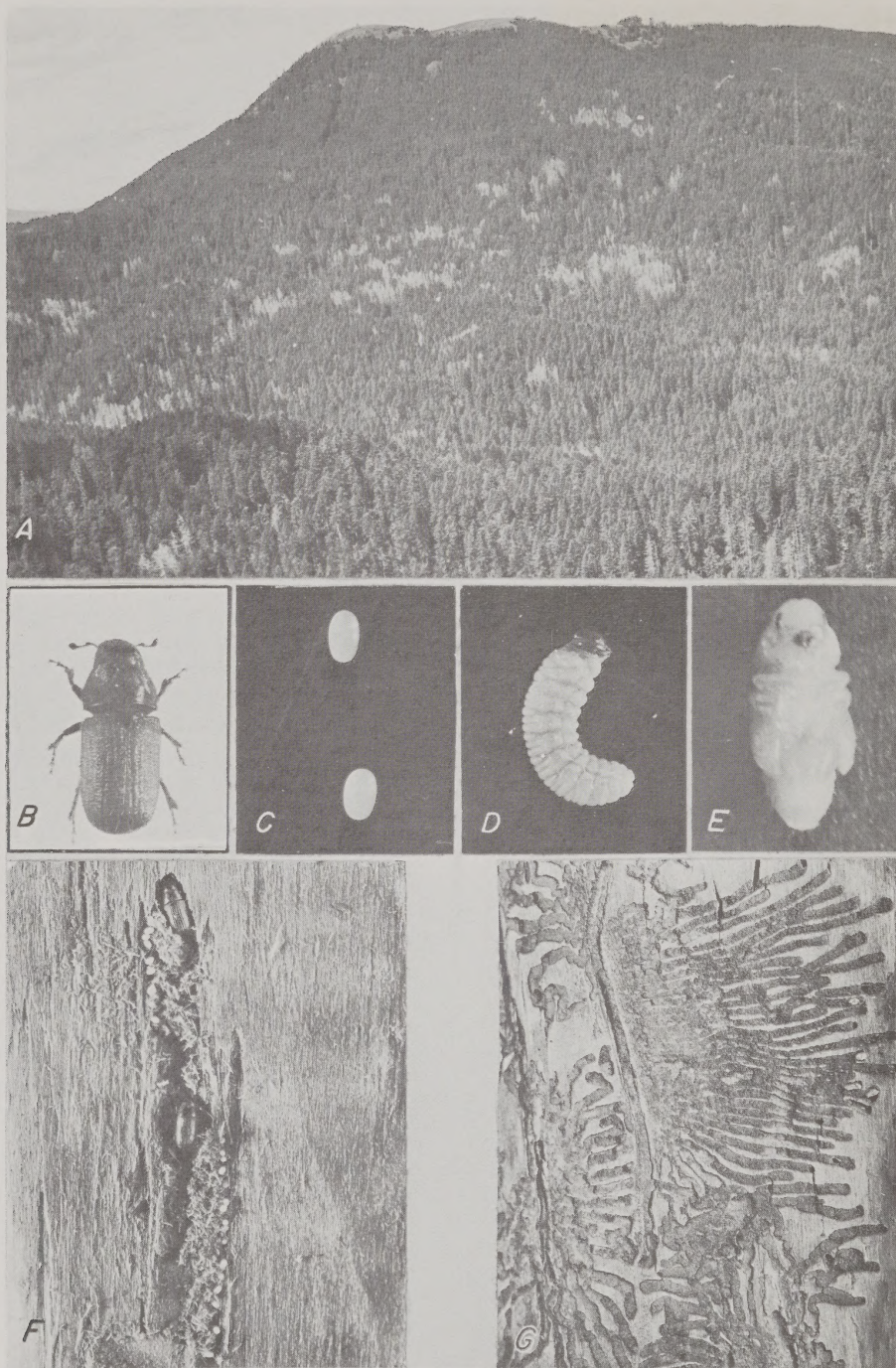


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Figure 1.—Range of Douglas-fir. Broken line (---) separates coastal variety, *menziesii*, from interior variety, *glauca*.

¹ Forest entomologist, Intermountain Forest and Range Experiment Station, USDA Forest Service.

² Forest entomologist, Pacific Northwest Region, USDA Forest Service.



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Figure 2.—Douglas-fir beetles: *A*, Attacked trees become evident as their foliage turns color; *B*, adult beetle; *C*, egg; *D*, legless larva; *E*, pupa; *F*, females preparing egg galleries; *G*, larval mines fanning outward from egg galleries.

tremendously and spreads to adjacent green timber.

Evidence of Attack

The first sign that a Douglas-fir has been successfully attacked is the reddish-orange boring dust in bark crevices or on the ground around the tree. Because wind and rain soon remove this evidence and because attacks are sometimes high above ground level, each tree must be examined carefully to determine if the beetles are present. Sometimes, the most evident sign of infestation is the clear resin exuded from attacks high on the stem near the upper limit of infestation.

Several months after the tree is attacked, its foliage becomes discolored (fig. 2, A). First the needles turn yellow, then sorrel, and, finally, a dark, reddish brown. The time of year this discoloration becomes visible varies according to region, elevation, and seasonal weather. In the northern Rocky Mountains, trees attacked in May or June may show little discoloration of foliage even in late fall. In Pacific Coast forests, however, trees attacked in the spring usually start fading by August, and by October, a large percentage of them appear as "red tops."

Appearance of the Insect

The life stages of the beetle are illustrated in figure 2, B to E. Mature Douglas-fir beetles are stout, somewhat cylindrical, and 5-6 mm. long. The wing covers are usually reddish brown, becoming darker with age, while the head and thorax are black. The whitish eggs are about 1 mm. long. Eggs hatch into white, legless grubs, or larvae, with shiny, light brown heads. Mature larvae transform to adult beetles after

passing through an inactive pupal stage.

Method of Attack and Habits

The Douglas-fir beetle, like many species of bark beetles, has a distinctive egg gallery (fig. 2, F and G). The female beetles bore into the bark and tunnel upward in the phloem (inner bark), lightly engraving the sapwood. Galleries run parallel to the grain of the wood and average from 5 to 12 inches long, being somewhat longer in windthrow. Galleries are packed with boring dust, except where the beetles are actively working. The females lay eggs alternately along opposite sides of the galleries as construction progresses. The eggs hatch in a week to 10 days, and the newly hatched larvae mine outward from the egg gallery in the phloem. These mines increase in width as the larvae grow. During the final stages of growth, larvae construct pupal cells at the ends of their mines.

Trees are killed by the girdling effects of the egg galleries and larval mines. Death is hastened by the action of various fungi which are introduced into the trees on the attacking beetles and which clog the sap-conducting systems.

Attacks of the Douglas-fir beetle are usually most abundant and successful midway up the tree. They may extend upward from the point of infection to a point about 8 to 10 inches in diameter. The lower portion of large trees may either escape attack entirely the first year or be unsuccessfully attacked. When this occurs, the base may be attacked the following year.

The Douglas-fir beetle has one generation per year. Broods of Douglas-fir beetles remain in the tree and overwinter as mature

larvae and adult beetles. During overwintering, adults are normally more abundant than larvae. Depending on variations in seasonal weather, the overwintering adults generally emerge and attack trees any time from April to early June, while the overwintering larvae complete their development and emerge to make their attacks in July and August of the same year. Some adults that make their first attacks from April to June reemerge sporadically throughout summer and make a second attack. The broods of beetles that originate from these different periods of attack mature and emerge approximately 1 year later.

Control

In addition to host tree resistance, several natural control factors tend to hold this destructive bark beetle in check. The more important of these other factors are climate and weather, parasitic insects and nematodes, and predacious insects and mites. The role of diseases in controlling the beetle has not been studied. Woodpeckers are of only slight importance.

When natural control fails, direct control of the beetle is difficult. It has not been economically feasible to chemically control the Douglas-fir beetle under forest conditions. On an experimental basis, broods in individual trees have been destroyed by sprays that fumigate the galleries. Similarly, contact residual insecticides have been shown experimentally to reduce attacks in logs. Fell, limb, and buck infested trees as needed. Do not treat trees with wet bark or green phloem. Dilute 1 quart of 85 percent ethylene dibromide emulsifiable concentrate in No. 2 fuel oil to make 5 gallons of spray. Using a low-

pressure sprayer, apply 1 gallon per 30 sq. ft. of bark surface to trees with bark less than 3 in. thick. Use of this insecticide is presently restricted to Federal pest control and cooperative State control projects.

Preventive control through proper management of Douglas-fir forests offers the best method of minimizing damage by the Douglas-fir beetle. Proper management involves the removal of damaged and infested trees and harvesting of overmature trees. Cull portions of tree stems left after logging should be destroyed by burning. Windthrow and other damaged trees, as well as infested trees, should be salvaged promptly before the beetles emerge. Conversion of overmature stands to young vigorous ones will greatly minimize losses. Trees less than about 100 years old are seldom infested in natural forests.

Caution:

Ethylene dibromide and other insecticides are poisons. Store them away from food products and read and follow closely the directions and precautions on the container label. If insecticides are handled or applied improperly, they may be injurious to humans, domestic animals, desirable plants, honeybees and other pollinating insects, fish, and wildlife. Also, they may contaminate water supplies.

References

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